
POPULAR
Computing
WEEKLY
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POPULAR Computing WEEKLY

The Team

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Articles which are submitted for publication should not be more than 1000 words long

All submissions should be typed and a double space should be left between each line

Programs should whenever possible be computer printed

At present we cannot guarantee to return every submitted article so please keep a copy

Accuracy
Popular Computing Weekly cannot accept any responsibility for any errors in programs we publish although we will always try our best to make sure programs work

This Week


Cover illustration by Terry Rogers

Editorial

Aladdin s Cave is not a new type of adventure game It is an aptly named treasure house of 'free software games, according to Prestel

The idea behind the scheme is that, with the aid of a Prestel adaptor you dial up Aladdin s Cave and see what programs are on offer If any of the games take your fancy you can download them directly into your micro

On the surface Aladdin s Cave is an excellent idea But the services of the genie are not free Apart from the cost of the adaptor, you must join Prestel s Micronet 800 scheme (*Popular Computing Weekly* September 16) which costs about £50 a year

In addition, the best programs are unlikely to be in Aladdin s Cave They will be available elsewhere in the Micronet system, at commercial rates Unlike Aladdin s Cave, you will be charged for downloading these programs

Nevertheless Aladdin s Cave and the Micronet 800 scheme could change the face of the software market in this country It will certainly be easier to download a program than to go out, buy a cassette and load it into your micro Whether or not it will be cheaper remains to be seen

Next Week


Journey to the centre of the earth and beyond in Tunnel — a new game for ZX81

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...

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New Rom for BBC micro in November

ACORN is to charge owners of the BBC micro for 1 0 operating systems to replace the present 0 1 The new Series 1 Roms should be available by the middle of November

In the case of orders for the Acorn disc interface (which costs £70) the new operating system will be supplied free Owners not wishing the disc interface will pay £11 50, says Acorn s Technical Adviser David Simpson

Several aspects of the present 0 1 operating system are causing problems for users the 0 1 will not support paged Roms — including disc operating system teletext adaptor or Econet system, there are problems with the Save and Load facilities and with some of the Fx calls

These difficulties have been corrected in the new Roms David Simpson explains "The new system gives extra operating system calls irons out a bug in the Rom in the Print # statement and allows the input of serial date using simple Fx commands "

"The 0 1 operating system is adequate but the subject of many discussions We have asked Acorn for a definitive answer on pricing " said John Radcliffe Executive Producer of the BBC s Computer Programme

Acorn's John Horton said We don t consider that people need the 1 0 system unless they have a disc operating system to support Problems arise when dumping large amounts of software on to tape and are caused by machine faults in the 0 1 operating system but there is a well publicised machine-code patch to solve most of the problems

Cut–price Pets

COMMODORE has cut the prices of its Pet range of products for use in education

The cost of Pets in schools has been cut by between 20 and 33 percent for a three month period which began on September 1

This move is a reaction to the company's exclusion from the government s Micros in Schools grants scheme (August 12)

A window into summer for enthralled youngsters

Cheap holidays for micro kids

THIS Summer over 200 boys and girls will have benefited from Tandy Computer Campe, a scheme organised by the North London based community resource group, Inter Action

Ed Berman, Inter-Action's founder, said 'The non-residential sessions help those kids who cannot afford to take advantage of the more expensive residential Summer campe outside London

'We are a charity The camps are run as a service for kids who are really keen to learn and not as a money-making exercise "

Inter-Action sessions cost £4 per day Those attending are taught to use the Tandy and Commodore microcomputers by six undergraduate tutors

Z80 disc pack from torch

TORCH Computers has launched a Z80 Disc Pack for the BBC micro The unit includes a Z80 card which enables the machine to run CP/M® software

The unit has a capacity of 800K uses twin 5¼in double-sided 80-track discs and includes its own power supply

The Z80 card fits inside the lid of the BBC machine and connects to the tube interface The disc unit connects to the disc interface A detailed instruction manual gives installation and operational advice

Possible expansion options for the system include upgrading to a Winchester drive and addition of the Torch communications card which can be fitted inside the disc unit to provide Prestel Viewdata and auto-dial capabilities.

The disc unit is already available as part of the Torch microcomputer package — based around the BBC machine — and costing £3500.

The Torch Z80 Disc Pack costs £995 An Acorn disc interface is also necessary and costs £70 The Corresponding Acorn disc drive costs £235 for 200K The Acorn Z80 card is not yet available but is expected to cost over £300

Further information on the Torch Z80 Disc Pack is available from Torch Computers Abberley House Great Shelford Cambridge

Torch Z80 Disc Pack

HP conference

PPC UK the British arm of the Hewlett Packard Programmable Calculator International Users Group is holding its annual conference in London on Saturday, October 9

The cost of the PPC-UK meeting will be £15 (members) and £20 (non members) More details from David Burch, PPC UK Astage Rectory Lane, Windlesham

Micronet 800 – a new deal from Prestel

PRESTEL has released more details of its Micronet 800 scheme, announced last week

The scheme due to be launched in January, will enable subscribers to buy a range of software and download it into their micros An educational exchange library will enable schools and colleges to share programs written by teachers and students Subscribers will also be able to exchange messages with each other, and any other Prestel user

The Amateur Computer Club and other local groups will be able to use the system to keep their members up-to-date on club activities

Aladdin's Cave is a collection of software, indexed by both subject and micro that can be accessed for free

Micronet 800 is a joint venture between Prestel/British Telecom, EMAP Computer & Business Publications Ltd/Telemap Ltd, ECC Publications Ltd and Prism Microproducts Subscription to Micronet 800 will cost approximately £50 a year

Further information is available from Micronet 800 Telemap Ltd, Bushfield House, Orton Centre, Peterborough PE2 OUW (telephone 0733-236113)

Move over Jaws — ET is on your trail

ATARI has signed a deal with MCA to produce a series of computer games based on the theme of Stephen Spielberg's new billion dollar film, *ET The Extra Terrestrial*

Graham Daubney, Atari's software manager, told *Popular Computing Weekly* "The games will use the *ET* characters and we hope to see them shortly after the film s UK launch at Christmas — definitely in the first quarter of 1983 "

The deal is one of many being set up by Merchandising Corporation of America to produce spin-offs from the movie

ET has been on general release in the US since July and will be released in the UK later this year

Letters

write to Letters, Popular Computing Weekly, Hobhouse Court, 19 Whitcomb Street, London WC2

Spelling out magic numbers

Glad to see that Sinclair have now reached the magic figure of 42 (*Popular Computing Weekly* July 29) I had thought, by the service and attention received from them, that they were at Milliways spending the year dead for tax reasons

J Roberts
10 Bulrush Close
Hatfield
Hertfordshire AL10 8PE

3-dimensional graphics

I would like to congratulate you on achieving a good mix of interesting items in your weekly magazine Of particular interest to me at the moment is Nick Hampshire's page on Spectrum graphics as I along with others await delivery of said machine

Could you ask Nick Hampshire if it is possible to have a moving/rotating disc or wheel as this could really be developed into some interesting graphics In the meantime I am saving all the articles ready to develop in my new Spectrum when it arrives

Don Williamson
44 Sutton Park Drive
St Helens
Merseyside WA9 3TR

In answer to your query, see PCW July 8 for Nick Hampshire's rotating fan program

Conspiracy of talents

One of your rival magazines recently gave the following quote "It is better to know where to go and not how to get there than to know how to get there but not know where"

Unfortunately many of your readers including myself, fall into the latter category We are capable of writing complex programs, but cannot think of original programs to write Thus we are forced to reproduce arcade games such as *Puckman* and *Space Invaders*

However not only does this mean that there is only a small range of programs available but also that many programmers risk prosecution (re Copyright *Popular Computing Weekly* August 5)

I feel it would be a good idea if people could pool ideas for new games ie those people with imagination but little knowledge of programming, could publicise their ideas for others to computerise A small percentage of any money made selling the program would be paid to the originator of the idea as an incentive

Unfortunately, this pooling of ideas would need a large database for storage, and printing facilities At present, I have neither and thus cannot operate such a scheme

However I would like to hear from any company with these facilities who would be interested in running this type of scheme Ideally the company would also market the finished product, handling the payments to both the programmer and the originator of the idea

John Hardman
65 Sandringham Drive
Welling
Kent DA16 3QZ

A philosophers life

I recently realised that I spend as much time watching a 32 × 24 matrix visualised at the end of a cathode ray tube as I do eating

Is this part of the natural order of life the universe and everything?

Simon Cross
6 The Avenue
Ipswich IP1 3SY

Leapfrogging in Street Alley

Re Street Alley (*Popular Computing Weekly* August 12) Excellent game but the frog has only one foot To get two feet, the eighth number of 750 should be 199

If a man is preferred, then 750 should read

```
750 Data 60 60 24 759 189
189 36 231 63
```

Alternatively, the first eight numbers can be any from A Blackham's character maker (July 15)

G Foreman
82 Harelton Road
Colchester
Essex CO4 3DY

Soldering on whirrs away

I ordered my Spectrum on May 10 and it arrived on August 5

When I switched it on, I was surprised to hear quite a loud buzz from inside the case — it sounds like an electric motor whirring away Using it with a Sony Trinitron, the set recommended by Sinclair, produced disappointing results with rolling bands of random colour Trying it with a Sharp set was more successful with clean, steady colours although there was a pronounced shimmer on graphics Yellow ink on green paper was virtually unreadable

A chat with a friendly TV engineer threw some light on the problem with the Sony He suggested I try adjusting a trimmer capacitor inside the Spectrum Getting inside was much easier than with the ZX81, as there are no screws hidden under the feet A small adjustment to the trimmer was all that was needed to make the Sony lock on

I also found that very small adjustments affected the shimmer I have been able to reduce it a little, but it is still far from perfect The pixels now tend to pulse rather than wobble Surely this must be a design fault?

After several hours of use, the internal temperature becomes disturbingly high (the heat sink is almost too hot to touch) It was during a cooking session when a bug developed the *Beep* command caused the computer to *New* itself Worse still, *Load* would not work and *New Newed* without having to press *Enter* Switching off for a while restored everything to normal Another look inside for dry joints etc, revealed a crack in a fine section of track, cured with a blob of solder

Since then the computer has behaved itself and despite these problems, I like the machine

S R Aizlewood
19 Brushfield Road
Holme Park
Chesterfield
Derbyshire

Doubled up on Vic20

Enclosed is a very simple and short method of obtaining double height characters on the Vic20 This method can be used with the basic Vic or with any expanded Vic But, with cartridges that program the function keys these have to be re-defined, eg, "Key 1,' Graphic" '

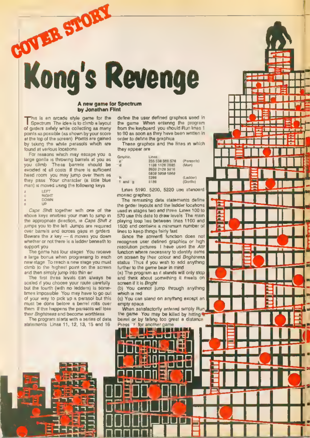
This program reproduces all the standard letters and graphics which appear on the right hand side of each key The memory required to program the characters is just under 1 5K, leaving 2K of memory still intact

It is advisable after the characters have been programmed to *New* the program used, as to get into the double height mode you have to type in the following — *Poke* 36867 (*Peek* (36867)) or 23, and *Poke* 36869 254 The programmed characters can not be written over by another program in memory, so a program of up to 2K can be entered safely without fear of deleting the characters

The program Line 1 — Sets various memory pointers to prevent 'writing over' Lines 2 and 3 — Transfer characters from Rom into Ram Line 4 — Changes screen colour/Puts Vic into double height mode Line 5 — Changes character set to programmable one (254)

```
1 POKE 56 24 POKE 56 8 CS=6144
2 FOR I=CS TO 7678
  STEP2 Z=PEEK(32768+(I-CS)/2)
3 POKE I,Z POKE I+1 Z NEXT
4 POKE 36879 25 POKE
  36867 (PEEK(36867))OR 23
5 POKE 36869 254 POKE 36881 24
```

Chris Groenhout
25 Kerferd Street
Watson ACT 2062
Australia



COVER STORY

Kong's Revenge

A new game for Spectrum
by Jonathan Flint

This is an arcade style game for the Spectrum The idea is to climb a layout of girders safely while collecting as many points as possible (as shown by your score at the top of the screen) Points are gained by taking the white parasols which are found at various locations

For reasons which may escape you a large gorilla is throwing barrels at you as you climb These barrels should be avoided at all costs If there is sufficient head room you may jump over them as they pass Your character (a little blue man) is moved using the following keys

z	LEFT
c	RIGHT
x	DOWN
s	UP

Caps Shift together with one of the above keys enables your man to jump in the appropriate direction, ie *Caps Shift z* jumps you to the left Jumps are required over barrels and across gaps in girders Beware the *x* key — it moves you down whether or not there is a ladder beneath to support you

The game has four stages You receive a large bonus when progressing to each new stage To reach a new stage you must climb to the highest point on the screen and then simply jump into thin air

The first three levels can always be scaled if you choose your route carefully but the fourth (with no ladders) is sometimes impossible You may have to go out of your way to pick up a parasol but this must be done before a barrel rolls over them If this happens the parasols will lose their *Brightness* and become worthless

The program starts with a series of data statements Lines 11, 12, 13, 15 and 16 define the user defined graphics used in the game When entering the program from the keyboard you should Run lines 1 to 90 as soon as they have been written in order to define the graphics

These graphics and the lines in which they appear are

Graphic	Lines	
e	255 550 560 570	(Parasols)
d	1100 1120 2085 2030 2120 5010 5030 5050 5060	(Man)
h	5200	(Ladder)
1 and g	5180	(Gorilla)

Lines 5190, 5200, 5220 use standard mosaic graphics

The remaining data statements define the girder layouts and the ladder locations used in stages two and three Lines 100 to 570 use this data to draw levels The main playing loop lies between lines 1100 and 1500 and contains a minimum number of lines to keep things fairly fast

Since the *screen$* function does not recognise user defined graphics or high resolution pictures I have used the *Attr* function where necessary to identify items on screen by their colour and *Brightness* status Thus if you wish to add anything further to the game bear in mind

(a) The program as it stands will only stop and think about something it meets on screen if it is *Bright*

(b) You cannot jump through anything which is red

(c) You can stand on anything except an empty space

When satisfactorily entered simply Run the game You may be killed by hitting a barrel or by falling too great a distance Press r for another game

```
1 REM Kong s Revenge
2 REM By J. Flint
3 REM
10 BORDER 5  INK 1  PAPER 6  C
LS
11 DATA "f",0,BIN 00001100,BIN
00001100,0,0,BIN 00001111,BIN 0
0001010,0
12 DATA "a",0,BIN 00110000,BIN
00110000,0,0,BIN 11110000,BIN 0
1010000,BIN 11110000
13 DATA "p",BIN 10001110,BIN 0
1110001,BIN 01100000,BIN 0101000
,BIN 10001000,BIN 10000100,BIN 1
0000010,BIN 01000100
15 DATA "d",BIN 00001000,BIN 0
1111110,BIN 10011000,BIN 0011110
0,BIN 00100100,BIN 00100100,BIN
00100100,BIN 00110110
16 DATA "h",BIN 01000100,BIN 0
1000100,BIN 01000100,BIN 0111110
0,BIN 01000100,BIN 01000100,BIN
01000100,BIN 01000100
18 DATA 18,17,0,20,14,2,26,10,
4,0,0,30,0,10,10,16,2,3,2,0,0,20
,4,12,0,4,10,11,8,3,21,8,3,24,12
,7,0,10,21
19 DATA 13,10,0,0,0,12,24,0,3,
0
20 DATA 0,15,20,21,16,10,0,18,
20,21,12,1,22,10,1,18,19,7,27,2,
4,24,1,2,20,0,0,2,0,3,0,0,32,2,4
,25,10,0,14
21 DATA 25,5,0,9,0,13,0,0,20,9
30 FOR g=1 TO 5
40 READ a$
50 FOR x=0 TO 7
60 READ a
70 POKE USR a$+x,a
80 NEXT x
90 NEXT g
100 LET sc=0  LET l=0
101 BRIGHT 0  BORDER 5  INK 1
PAPER 6  CLS
102 OVER 0  INK 0
105 FOR x=1 TO 140 STEP 30-16*(
l>2)
110 PLOT 0,x
130 FOR n=1 TO 31
140 DRAW 4,0  DRAW 0,4  DRAW 4,
0  DRAW 0,-4
150 NEXT n
155 DRAW 0,0
160 DRAW -240,0
170 NEXT x
175 GO SUB 5170
250 FOR Y=5 TO 19 STEP 4-2*(l>2
)
255 PRINT AT y+1,RND*29, BRIGHT
1, INK 7,"K"
260 LET T=28*RND
261 LET s=28*RND
265 PRINT AT y,s,"."
280 IF l<=2 THEN GO SUB 5270
300 NEXT y
310 PLOT 200,143
320 DRAW 7,0
330 PLOT 216,159
340 DRAW 7,0
350 GO TO 1000
390 INK 2
395 FOR t=1 TO 10
400 READ a,b,c
410 PLOT a*8,b*8+8
420 FOR x=1 TO c-1
430 DRAW 4,-2  DRAW 4,2
440 NEXT x
445 DRAW 4,-2  DRAW 3,3
450 DRAW -8*(c-.1),0
460 NEXT t
500 FOR c=1 TO 5
510 READ t,y  GO SUB 5270
520 NEXT c
530 GO SUB 5170
540 BRIGHT 1  INK 7
550 PRINT AT 0,1,"K"
560 PRINT AT 12,3,"K"
570 PRINT AT 18,30,"K"
580 IF l=2 THEN PRINT AT 2,13,
INK 1,"DDDDDD"
1000 LET y=0
1010 GO SUB 4000  GO SUB 4010
1020 BRIGHT 0  OVER 1  INK 0  FL
ASH 0
1030 LET y=20  LET x=0
1040 PRINT AT 1,14, OVER 0, INK
7, BRIGHT 1,sc
1100 PRINT BRIGHT 0,AT Y,X,"f"
1104 IF SCREEN$ (y+1,x)=" " THEN
 GO SUB 2000
1105 PRINT BRIGHT 1,AT p,q,"D"
1110 PRINT BRIGHT 1,AT p1,q1,"D"
1120 BEEP (INKEY$<>" ")/50,-y
1125 IF ATTR (y,x)>64 THEN GO TO
 3000
1126 PRINT AT Y,X,"f"
1130 LET x=x+(INKEY$="c")-(INKEY
$="z")
1132 LET y=y-(INKEY$="s")+(INKEY
$="x")
1140 IF INKEY$<"a" AND INKEY$>"A"
 THEN GO SUB 5000
1150 PRINT ,AT p,q,"D"
1160 PRINT ,AT p1,q1,"D"
1170 GO SUB 3510
1180 IF SCREEN$ (p+1,q)=" " THEN
 LET p=p+2
1190 IF SCREEN$ (p1+1,q1)=" " TH
EN LET p1=p1+2
1500 GO TO 1100
2000 REM DROP
2005 PRINT AT y,x,"f"
2007 IF y<1 THEN GO TO 6000
2010 FOR b=1 TO 2
2020 LET y=y+1
2030 PRINT AT y,x,"f"
2040 IF SCREEN$ (y+1,x)=" " THEN
 BEEP .1,-10  RETURN
2050 GO SUB 3510
2120 PRINT AT y,x,"f"
2125 NEXT b
2130 IF SCREEN$ (y+1,x)=" " THEN
 GO TO 2500
2140 LET y=y+1  GO TO 2130
2500 PRINT AT y,x-2, OVER 0, FLA
SH 1, INK 2,"SPLAT"
2530 FOR x=0 TO -30 STEP -1  BEE
P .00,x  NEXT x
2540 IF INKEY$="r" THEN CLS  RE
STORE 10  GO TO 100
2550 GO TO 2540
3000 REM BRIGHT
3005 IF ATTR (y,x)<>119 THEN GO
TO 2500
3010 BEEP .2,36
3020 LET sc=sc+100
3030 PRINT AT 1,14, OVER 0, INK
7, BRIGHT 1,sc
3040 PRINT AT y,x, OVER 0, INK 1

3050 GO TO 1130
3500 REM BARREL
3510 LET q=q+d  LET q1=q1+d1
3520 IF q1>30 OR q1<1 THEN LET d
1=-d1  IF p1>y THEN GO SUB 4010
3540 IF q>30 OR q<1 THEN LET d=-
d  IF p>y THEN GO SUB 4000
3550 RETURN
4000 LET d=1  LET q=1  LET p=2*I
NT (y/3)  RETURN
4010 LET d1=-1  LET q1=29  LET p
1=2*INT (y/3)  RETURN
5000 LET g=(INKEY$="C")-(INKEY$=
"Z")
5009 BRIGHT 0
5010 PRINT AT y-1,x,"f"  BEEP .0
6,0
5020 IF ATTR (y-1,x)=50 THEN GO
TO 2500
5030 PRINT AT y-2,x+g,"f"  BEEP
.05,12
5050 PRINT AT y-1,x,"f"
5052 PRINT AT y-2,x+g,"f"  BEEP
.05,24
5080 LET x=x+2*g  LET y=y-2
5090 BRIGHT 0
5100 IF ATTR (y,x)>64 THEN GO TO
 3000
5120 RETURN
5170 REM GORILLA
5175 PAPER 2  INK 0  FLASH 1
5180 PRINT AT 0,9,"  "
5190 PRINT AT 1,8,"   "
5200 PRINT AT 2,8,"   "
5220 PRINT AT 3,8,"   "
5232 FLASH 0  PAPER 6
5240 RETURN
5260 REM Ladder
5270 FOR X=0 TO 3
5280 PRINT AT x+y,t, INK 1,"H"
5290 NEXT X
5300 RETURN
6000 REM Again
6020 LET SC=SC*2+100
6030 BEEP .3,10  BEEP .3,24  BEE
P .3,12  BEEP .3,24  BEEP 1,0
6040 INK 1  CLS
6050 LET l=l+1
6060 IF l<>2 THEN RESTORE 10  GO
TO 101
6070 GO TO 390
```

Street Life

Indoor garden party for ZX fans

***David Kelly** reports on the 4th London ZX Microfair and finds business is booming*

Over 6000 expectant ZX81 and Spectrum owners made their way to the 4th London ZX Microfair in Victoria on Saturday August 21 The New Horticultural Hall built in 1928 proved to be far more popular than the previous venue the Westminster Central Hall By lunch-time all that could be seen of the hall was a seething mass of heads

Mike Johnston, the show's organiser was clearly delighted "My only worry" he said "was that the delay in production of the Spectrum would mean that none of the companies would have any Spectrum products to sell or display"

In the event, most of the companies at the fair managed to put some Spectrum wares on show This was clearly necessary, since interest seemed to centre on products for the new machine

Several of the 75 or so exhibitors commented that from the time of the Spectrum launch sales of their ZX81 stock were considerably reduced

One software company even went so far as to say that its ZX81 stock 'died' with the announcement of the new machine

It has been a lean time for companies this summer while they waited for their new Sinclair machines Now however most of the companies have received their Spectrums and are frantically trying to stay in a market that has suddenly taken off at a tangent

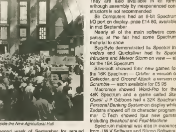
After several fairly dismal microfairs — including the last London and Manchester ZX Microfairs — the scene is once again alive

There were at least eight Spectrums and one Dragon 32 available on various stands They proved to be a strong draw for those people still waiting for their own machines

Kempston (Micro) Electronics demonstrated its new joystick for the Spectrum The unit plugs into the Kempston I/O controller card which, in turn plugs into the port at the rear of the machine Up to four joysticks can be connected to the card at the same time and individually addressed from the Spectrum The controller card is currently available for £16 50 and the joystick together with demonstration tape and instructions will be available by the second week of September for around £9 50



Avid micro enthusiasts fingers poised at the keyboard.



Inside the New Agricultural Hall

Stephen Adams displayed his £7 ZX81/Spectrum Ram converter This device allows a ZX81 Ram pack to be fitted to the rear port of the Spectrum to convert a 16K machine into a 32K one

Memotech showed a new Centronics printer interface for use either with the ZX81 or ZX Spectrum A similar RS232 interface will be available by mid-September Both interfaces cost £39 95

East London Robotics had its 64K and 32K plug in Ram expansion modules for the Spectrum for sale The boards are available for £50 and £35, respectively They are also available in kit form although assembly by inexperienced constructors is not recommended

Sir Computers had an 8-bit Spectrum I/O port on display price £14 50, available in mid September

Nearly all of the main software companies at the fair had some Spectrum material to show

Bug-Byte demonstrated its *Spectral Invaders* and Quicksilver had its *Space Intruders* and *Meteor Storm* on view — all for the 16K Spectrum

Silversoft showed their new games for the 16K Spectrum — *Orbiter* a version of *Defender* and *Ground Attack* a version of *Scramble* — each available for £5 95

Macronics showed *Word-Pro* for the 48K Spectrum and a game called *Star Quest* J P Gibbons had a 32K Spectrum *Personal Banking System* on display while Zedxtra showed off its character programmer C Tech showed four new games including *Breakout* and *Fruit-Machine*

Spectrum material was also in evidence from J W V Software and Silicon Software

The impact of Atari's copyright actions against Commodore and Bug Byte was being felt by many of the software companies Concern centred, not so much on the Atari action itself but on the general uncertainty of this area of the law No one knows how different a program has to be from an original game before it ceases to be an infringement of copyright

The next London ZX Microfair will be held on December 18 The venue has yet to be finalised

Machine Code

Ian Stewart and Robin Jones present a new series for beginners

From the left by numbers

People normally think about numbers in terms of tens If you write the number 3814 we all understand that to mean

$3 \times 1000 + 8 \times 100 + 1 \times 10 + 4 \times 1$

and we can see that to get a ' place value' from the one on its right we simply multiply by ten We say the number is in *base* ten

Because we ve been doing this for as long as we can remember it s difficult to realise that there are other perfectly sensible ways of doing the same job Early computer designers certainly didn t they used base ten representations in their machines and hit some nasty snags Most of these problems were caused by the fact that electronic amplifiers don t behave the same way for all the signals you want to input to them For instance an amplifier that is supposed to output double its input signal may well do so for inputs of 1 2 3 and 4 units but then it starts to "flatten off" so that an input of 5 produces an output of only 9 6 6 produces 10 8 and you can hardly tell the difference between the outputs for inputs of 8 and 9

Put a music tape in a cheap cassette recorder and wind up the volume Hear the distortion in the loud bits? It s the same effect

The simplest thing you can do with an electrical signal is to turn it on or off so you can represent the digits 0 (off) and 1 (on) satisfactorily Distortion no longer matters It s clear whether a signal is present or not regardless of how mangled it is But can we devise a number system which only uses 0s and 1s?

Yes In a base ten number, the largest possible digit is 9 Add 1 to 9 and you get 10—a *carry* has taken place We can write any number using any other base we choose and the largest possible digit will always be one less than the base If the base is 2 the largest digit is 1 so a base 2 (or *binary*) number only contains 0s and 1s

What about the place values? In the base ten case we got those by starting at 1 (on the right) and multiplying by 10 every time we moved left one place For a binary number we still start at 1 but we multiply by 2 every time we move left

So for instance the binary number 1101 can be converted to base 10 like this

```
1   1   0   1
|   |   |   |
|   |   |   └──────→ × 1 ──→  1
|   |   └──────────→ × 2 ──→  0
|   └──────────────→ × 4 ──→  4
└──────────────────→ × 8 ──→  8
                             ──
                             13
```

Converting the other way is easy as well Take 25 for example If you write down the binary place values

32 16 8 4 2 1

and work from the left it s clear that you need a 16 Subtract 16 from 25 and you will be left with 9 and that s made up of an 8 and a 1 so 25 is

0 1 1 0 0 1

Hexadecimal code

This is fine for relatively small values, but a bit messy for large ones There are a number of quick conversion techniques and there are binary-to-decimal and decimal to binary conversion program listings in *PEEK POKE BYTE & RAM!* but we want to examine a procedure which makes use of *hexadecimal* code because it will stand you in good stead later

A number in hex (nobody ever says "hexadecimal" except us just now) is a number in base 16 So the place values are obtained by successive multiplications by 16 The first five are

65536 4096 256 16 1

"Hang about! everybody s saying "Those are nasty numbers and anyway, in base 16 the largest digit has the value 15 Things are getting complicated '

Bear with us We handle the problem of digits greater than 9 by assigning the letters A-F to the values 10-15 So the number 2AD in hex converts to decimal like this

```
2   A   D
|   |   |
|   |   └────→ × 1   ──→  13   (D = 13)
|   └────────→ × 16  ──→  160  (A = 10)
└────────────→ × 256 ──→  512
                          ───
                          685
```

Now for the nice feature of hex Because 16 is one of the binary place values (the fifth one) it turns out that each hex digit in a number can be replaced by the four binary digits which represent it (By the way "binary digit ' takes almost as long to say as "hexadecimal so it s normally abbreviated to "*bit*) The following table shows the conversions

Decimal	Hex	Binary
0	0	0000
1	1	0001
2	2	0010
3	3	0011
4	4	0100
5	5	0101
6	6	0110
7	7	0111
8	8	1000
9	9	1001
10	A	1010
11	B	1011
12	C	1100
13	D	1101
14	E	1110
15	F	1111

Now suppose we want to convert 9041 to hex First we extract two 4096s then some 256s and so on like this

```
                 9041
2 × 4096 =       8192 −
                 ────
                  849
3 × 256  =        768 −
                  ───
                   81
5 × 16   =         80 −
                   ──
                    1
1 × 1    =          1 −
                    ─
                    0
```

So the hex representation is 2351 Now we just copy the digit codes from the table

2	3	5	1
0010	0011	0101	0001

and that s the binary equivalent of 9041 — just run the four blocks together to get 0010001101010001

The hex-to-binary conversion is so easy that more often than not we leave numbers in hex even when ultimately we need them in binary

Conversion by Computer

Here s a program to convert from decimal to hex It successively divides the number by 16 looking at the remainder each time so it extracts digits in the opposite order to that shown previously

```
1 DIM HEX$(4)
20 LET P=4
30 LET HEX$="0000"
40 PRINT "ENTER DECIMAL NO (MAX 65535)"
50 INPUT DN
60 LET N=INT (DN/16)
70 LET HEX$ (P)=CHR$ (DN-16*N+28)
80 LET DN=N
90 LET P=P-1
100 IF DN>0 THEN GOTO 60
110 PRINT "HEX VALUE IS ";HEX$
```

The result is always presented as a 4-digit number with leading zeroes if there are fewer than 4 significant digits The program won t work if the result should contain more than 4 digits, but that s ideal for our purposes as you shall see

Here s the code to convert in the opposite direction (hex to decimal)

```
140 PRINT "ENTER 4 DIGIT HEX NO"
150 INPUT HEX$
180 LET DN=0
170 FOR P=1 TO 4
180 LET DN=DN*16+(CODE(HEX$(P))-28)
190 NEXT P
200 PRINT "DECIMAL VALUE IS ";DN
```

We could tie these routines together with a little menu

```
2 PRINT "DEC/HEX CONVERTOR"
3 PRINT "1)DEC->HEX"
4 PRINT "2)HEX->DEC"
5 PRINT "3)END"
6 PRINT "ENTER 1 2 OR 3"
7 INPUT SEL
8 IF SEL=1 THEN GOSUB 20
9 IF SEL=2 THEN GOSUB 140
10 IF SEL=3 THEN STOP
```

and, of course, we ll need *Returns* at lines 120 and 210

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Somewhere over the rainbow?

***Boris Allan** treads the yellow brick road, looking at the latest Spectrum software*

The ZX Spectrum is a far different machine to the old ZX81, but many software writers do not seem to have noticed

I was rather disheartened to discover that at least two of the programs were being promoted by their length — a program may be long either because it is complex or because it is poorly written In the case of two programs I suspect the main reason is the latter

Some programs loaded the user-defined characters of cassette by use of the *Load " Code* command which meant that 16K programs would not work on 48K (and *vice versa*) All that was needed was the simple command *Load " Code Usr* a and the same program worked on either system Little things like this suggested that the program writers did not know the Spectrum well enough to use it to the full

Other hangovers from the past were the way in which programs were written to use graphics which — apart from the colour — were in no way superior to ZX81 programs

Of the programs I review here, only some are worth examining in detail For a change, I will first look at the three which are far and away the worst specimens

Inheritance is easily the worst program For a program with such a long listing there seem to be no error traps — an example of inefficient programming. The game is in two sections, building up an inheritance on the stock market (with a bit of gambling) and then using the inheritance to run a business

To win at the first section, all you have to do is place half your money on a good bet (or what seemed to be a good bet) and an equal but minus, amount on a bad bet For example in Black-jack if your first card was low bet a minus amount, so that when you lose you lose a minus amount (ie gain a positive amount) Using such tricks it was easy to win Surely no decent program with an 11 foot print out should allow this

Boris Allan the ZX Spectrum is a far different machine to the old ZX81

In the second section all that was needed was to have a negative number of advertising outlets (−1E14 was popular) to succeed A waste of time I had more fun trying to trip it up than actually playing it properly

Venture was little better — a ZX81 program masquerading as a Spectrum program — and again one for which claims were made regarding length This was the program with copious ZX81-type graphics and many superfluous *Ifs* Only capital letters were allowed for input It would not accept lower case

> “ Inheritance *is easily the worst program For a program with such a long listing there seem to be no error traps* ”

The program was a series of games on the way to a final maze where one collected gold Included were a bomber style game which made little use of the Spectrum's facilities and a Mastermind type game which gave you 14 attempts to find the solution when the most you need is eight In the final maze you could accumulate items simply by going over the same spot

Supersoft supplied three programs — *an Editor Lgame* and *Graphics* At first I thought that the *Graphics* program (it helps to construct user defined characters) was over-priced at £5 — especially as it is so simple to define characters in any case — but later, when I found that a superior program was part of the free *Horizon* cassette, I was certain

Lgame (also £5) is based on the original version by lateral thinker Edward de Bono The program was not complex, though an attempt was made to disguise the structure by the use of *Goto* labels (and not line numbers)

The final offering, *Editor* (at £15), was a text editor — not a word processor The program was so rudimentary it did not even use the screen input was into a string at the normal input position The program's author claims "*Editor* is a program that turns the ZX Spectrum into a true word processor — but this is just not so True word processors allow you to

change the formatting of the file within the file as part of text, and this is not possible with this system *Editor* is not easy to use is far too easily crashed, and is not recommended

Spectral Invaders from Bug Byte was a distinct improvement though I prefer Quicksilva's *Space Intruders* and Campbell System's *Gulpman* *Spectral Invaders* is a rather sedate game of the invaders type, with large slow moving aliens Bands of colour are set across the screen and each invader takes the colour of the band, rather than being individually pigmented

At the end, the increase in speed of the invaders was not significant The game was also spoilt by having to enter the game each time a base was destroyed — much better the instant appearance of your next base

All the offerings from Abacus were standard, usually maze-type games *Android Pit-Rescue* had a bug in it such that if your laser blasted the bottom of the pit you had an out-of-range error

The three games from Lomax were middling Two (*Defender* and *Thezeus*) loaded defined characters from cassette and the loading program had to be modified to load at *Usr* ''a Defender was

Looking for a pot of gold?

rather tame — almost an introductory attempt to produce a game using graphics, and was of the blow-up-all-the-Klingon-space-ships-with-your-lasers-type The instructions are not complex — they do not need to be — and are incorrect at one point (it is 0 to fire and not f) *Thezeus* was of the collect-the-goodies-from-the-maze-but-do-not-trigger-the-hidden-bombs type *Squash* was poor without being terrible

I will discuss the two disassemblers at this point, because they are not games and every program has to be somewhere — to paraphrase Spike Milligan

Both utility programs worked *SPDE* had instructions within the program and offered

Supplier	Program	Comment	Price
Bug-Byte 98-100 The Albany Old Hall Street, Liverpool	*Spectral Invaders*	Standard	£6
Artic Computing 396 James Reckitt Avenue, Hull	*Spectrum Bug*	Useful utility	£9.95
Simon W Hessel Software 15 Lytham Court Cardwell Crescent, Sunninghill, Berks	*Inheritance*	Poorly written	£5 95
Campbell Systems 15 Rous Road, Buckhurst Hill Essex	*SPDE* *Gulpman*	Useful utility An extraordinarily good program	£5 95 £5 95
Lomax 25 Parkway Crowthorne Berkshire	*Defender* *Squash* *Thezeus*	Average	£4 50 for the three
ZX-Guaranteed 29 Chadderton Drive Unsworth, Bury Lancs	*Venture*	Thinks it's a ZX81 program	£6
Psion Sinclair Research	*Horizons*	Excellent value	Free with Spectrum
Abacus Programs, 189 St Hellens Ave Swansea, West Glamorgan	*Destroyer* *Battle* *Iceberg* *Android Pit rescue*	Subchase Tankchase Grippingly tedious And again	£4 95 £4.95 £5 95 for the two
Supersoft, 8a Newlands Ave, Southampton	*Editor* *Lgame* *Graphics*	Must be joking at this price Poor Free in *Horizons*	£15 £5 £5

facilities to convert from hexadecimal to decimal and *vice versa* and other little treats *Spectrum Bug* game with instructions on the insert and an instruction booklet is threatened

There were little hiccups with both disassemblers The Artic version (*Spectrum Bug*) was perhaps the more complete, but the Campbell Systems version (*SPDE*) was rather easier to use and modify *Spectrum Bug* is in machine code whereas *SPDE* is written in Basic There is little to choose between them, though my personal preference is for *SPDE*

" There were little hiccups with both disassemblers Artic was perhaps the more complete, but Campbell Systems easier to use and modify "

The *Horizons* cassette is now to be given away free with every Spectrum Apart from one bug in the keyboard trainer (characters were selected at random and sometimes *Enter* was chosen, and appeared as a "?") *Horizons* seems fine

Side A is explainatory — What is a computer What is a Spectrum, and What is a keyboard? While it generated no great enthusiasm the keyboard trainer was more fun than some of the other cassettes reviewed here

Side B contained games and demonstrations including the best *Break-out* version yet seen for the Spectrum, a competent (perhaps even good) character generator, a line draw program, and an intriguing sine-wave addition program (very pretty) Also on the tape were other more mundane programs such as *Life Bubblesort Evolution* and *Monte Carlo* Easily the best value for money of all cassettes — it's free — and not bad either

Gulpman

Gulpman is the one cassette that I would buy (given that Horizons is free) In *Gulpman* you go round picking up apples while being chased by nasties You are protected only by lasers and your wits You have nine lives

It is possible to choose between nine speeds nine 'grades' (how fast the nasties are compared to you) and 15 different mazes (each requiring a different strategy) You can also choose which keys control your movements

You can run a demonstration on any type of maze, and save that version of the game with *your* keys, plus reset high score and other twiddly bits An exceptional program Given the work involved and the way the whole program is packaged it is well worth the £6 — and I do not often think that

Summary

When are software writers going to realise that the Spectrum is a different machine from the ZX81? And when will people stop re-using all the same old ideas? Apart from the two disassemblers only Gulpman and Horizons really stand out


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How to contribute

Each week the editor goes through all the programs that you send to Open Forum in order to find the Program of the Week.

The author of that program will qualify for DOUBLE the usual fee we pay for published programs.
(The usual fee is £10.)

Presentation hints

Programs which are most likely to be considered for the Program of the Week will be computer printed and accompanied by a cassette.

The program will be well documented, the documentation being typed with a double spacing between each line.

The documentation should start with a general description of the program and then give some detail of how the program has been constructed and of its special features.

Listings taken from a ZX Printer should be cut into convenient lengths and carefully stuck down on to white paper, avoiding any creasing.

Please enclose a stamped, self-addressed envelope.

Bricks

on ZX81

In this game for a 16K ZX81 84 bricks are placed across the base of the screen and they have to be removed by bombing them from a craft which moves backwards and forwards across the top. The speed of this craft is set by the player from fairly slow to very fast indeed. The speed of the game is achieved by writing the majority of the game in machine code.

If a brick is missed — and it becomes harder and harder to hit a brick as the number diminishes — the rows of bricks advance towards the top of the screen. Your mission is to destroy all the bricks before they reach the top.

Program notes

Line 1 is the REM statement which contains all the machine code.

Lines 150 to 156 set up the instructions on the screen and set the speed of the game from the player's instructions.

Lines 160 to 260 set up the game on the screen.

Lines 260 to 300 is the game loop itself.

Lines 510 to 585 are reached if the bricks reach the top of the screen.

Lines 600 onwards are reached if the entire wall is demolished and it then tells you how many shots were on target and invites you to play again (this invitation is also extended if you do not succeed).

GOTO 1000 can be used to save the program and it will then run immediately upon subsequent loadings.

```
TEA   E MACHINE CODE PART
 HE PROGRAM USE A REM STATE
L T AT LINE  NE THERE  URE THE
 I HA  OME 260 CHARACTERS
(EV IT)    HE FULL HEX LOAD
PROGRAM SHOULD LOOK LIKE

  1 REM  [machine code characters]
 10 PRINT "TYPE IN THE NUMBER OF BYTES TO BE INSERTED"
 15 INPUT I
 20 CLS
 30 FOR X=16514 TO 16514+I
 40 LET Y=INT (PEEK X/16)
 50 SCROLL
 60 PRINT X;TAB 10;CHR$ (Y+28);CHR$ (PEEK X-16*Y+28)
 70 INPUT A$
 80 IF A$="" OR LEN A$<2 THEN GOTO 110
 90 IF CODE A$<28 OR CODE A$(2)<28 OR CODE A$>43 OR CODE A$(2)>43 THEN GOTO 110
100 POKE X,16*CODE A$+CODE A$(2)-476
105 PRINT TAB 15;A$
110 NEXT X

RUN THIS PROGRAM TO ENTER THE
MACHINE CODE SHOWN IN THE NEXT
COLUMN.  WHEN COMPLETE DELETE
ALL OF THE HEX LOAD PROGRAM
EXCEPT LINE ONE.
THE FULL PROGRAM CAN NOW BE
ENTERED AS BELOW

130 CLS
132 PRINT TAB 13;"BRICKS",TAB 1
134 PRINT "    DEMOLISH AS MANY BRICKS AS YOU CAN BY PRESSING ANY KEY WHEN YOU WANT TO FIRE."
136 PRINT "    EACH TIME YOU MISS THE BRICKS MOVE UP ONE LINE. YOU HAVE TO STOP THEM REACHING THE TOP."
137 PRINT "    TYPE IN THE SPEED OF CRAFT FROM 1 TO 8",,,TAB 2;"1 IS SLOW",TAB 2;"4 IS FAST",TAB 2;"8 IS IMPOSSIBLE"
139 LET A$=INKEY$
140 IF A$="" THEN GOTO 139
145 IF CODE A$<29 OR CODE A$>37 THEN GOTO 139
150 LET S=VAL A$
155 POKE 16685,21-4*S
160 CLS
200 POKE 16615,0
210 FOR X=1 TO 14
220 FOR Y=11 TO 18 STEP 4
230 PRINT AT Y,X*2;"█";AT Y+1,X*2;"█"
240 NEXT Y
250 NEXT X
255 PRINT AT 0,0;"▣"
270 POKE 16514,0
280 LET L=USR 16518
290 IF L THEN GOTO 500
294 FOR Y=1 TO 10
295 NEXT Y
300 GOTO 280
500 IF L=100 THEN GOTO 600
510 FOR X=1 TO 3
520 LET G=USR 16728
530 FOR Y=1 TO 5
540 NEXT Y
550 NEXT X
590 PRINT AT 10,4;"  FAILED  "
595 GOTO 700
600 LET G=USR 16753
605 PRINT AT 10,7;"CONGRATULATIONS"
610 PRINT AT 20,0;INT (84000/(84+PEEK 16615));" PERCENT OF SHOTS ON TARGET"
700 PRINT AT 21,0;"ANOTHER GAME ?"
710 INPUT A$
720 IF CODE A$<>51 THEN RUN
750 STOP
1000 SAVE "BRICK▣"
1010 RUN

THE CHARACTER IN LINE 600 IS
AN INVERSE STAR
```

```
                BRICKS

THE FOLLOWING HEX CODES NEED TO
BE ENTERED USING THE HEX LOAD
PROGRAM. THE LOCATION TO WHICH
THE CODE IS ENTERED IS SHOWN
EVERY TWENTY BYTES. (READ THE
LINES OF CODE ACROSS THE PAGE.)

16514
00   2A   0C   40   3C
FE   1E   38   16   ED
5B   0C   40   21   20
00   19   54   5D   28

16534
01   1F   00   EC   00
32   00   40   10   19
ED   58   0C   40   01
01   00   19   E4   0D

16554
23   01   1F   00   ED
00   FE   3A   28   02
3E   00   32   02   40
CD   00   02   0C   00

16574
10   3A   0C   40   3A
00   40   FE   12   30
04   C0   0B   10   04
4F   3E   C7   01   00

16594
00   4F   00   02   E0
40   0E   31   30   0E
0C   85   00   FF   10
FE   0D   00   0C   10

16614
F7   00   00   00   1E
14   09   7E   36   17
05   FF   10   FE   FE
00   20   34   1D   20

16634
F1   1E   14   3A   E0
40   00   00   02   01
00   36   00   1D   20
FA   3A   27   40   3C

16654
3E   E7   00   2A   0C
40   64   00   01   21
00   09   01   00   02
ED   00   0A   0C   40

16674
23   06   00   0E   20
3E   00   CD   61   C9
3E   16   03   2A   E0
40   05   00   0C   01

16694
09   35   00   3D   20
FA   2A   E8   40   30
00   2A   0C   40   23
00   03   0E   D5   32

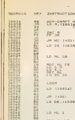
16714
A0   ED   01   06   00
0E   00   C0   0E   04
C0   0A   0C   40   05
10   C5   06   20   23

16734
7E   FE   7F   30   04
0E   00   10   02   C0
00   77   10   F1   23
C1   10   EA   C9   0E

16754
03   06   52   10   02
06   FF   3E   07   D7
10   FD   0D   20   C8
C9   3D   3D   3D   3D
```

to next page

PROGRAM OF THE WEEK



Bricks
by Peter Vincent

Golf

on Spectrum

Golf, as the name implies is a game which places you on a golf course generated by the computer Your task is to get round the course in as few shots as possible by missing the bunkers dodging the rivers and the trees keeping out of the rough and putting accurately when you get close to the flag

When the program is on the computer type *Run* to start and enter the number of holes that you wish to play After a short pause you will be asked to enter your handicap (between 1 and 3) If you enter your handicap as 1 then you will be able to hit the ball further but you will also have longer holes and you will also have a smaller par

If you choose a handicap of 3 you will have slightly shorter holes and you will have a larger par but you will not be able to hit the ball as far When you have entered your handicap the hole will be displayed using the following symbols the flashing T on the left is the Tee the dark green (a chess board character of black and green) is the rough and landing in this will decrease the strength of your shot considerably

The light green in the centre (a chess board character of cyan and green) is the fairway the light green square on the right is the green with the flag in the centre the black objects dotted about are trees and hitting one of these costs a penalty shot

The yellow and black characters are bunkers and landing in one of these causes the strength of your shot to be cut considerably

The blue characters are lakes and landing in one of these costs a penalty shot The distance across the screen is displayed in yards in the top left The par for the hole is displayed in the centre at the top and the number of shots you have taken is at the top on the right (if you have had any)

You are then asked to enter the strength of your shot (in yards) the direction of your shot (this is like a clock eg 12 is up 3 is right 6 is down etc decimals eg 1 5 are allowed) the computer then works out where your shot landed turn to next page

from previous page

```
  S GOODSON   AUGUST  82

This was written on a
48K SPECTRUM but the program
will run on a 16K version

   1 REM      GOLF
   2 REM   S GOODMAN  AUGUST 82
   4 LET TP=0  LET H=0
   8 INPUT  "HOW MANY HOLES   "TH
  10 GO SUB 9500
  20 LET C$=""
  30 LET B$=CHR$ 160+CHR$ 160+CHR$ 159
  50 FOR F=1 TO 8  LET C$=C$+CHR$ 146  NEXT F
  90 INPUT  "ENTER HANDICAP (1 TO 3)  1 IS BEST  3 IS WORST"HC
  95 IF HC<1 OR HC>3 THEN GO TO 90
 102 OVER 0  PAPER 7  CLS
 104 FOR F=1 TO 704  PRINT INK 0 PAPER 4,CHR$ 144,  NEXT F
 105 FOR I=2 TO 28 STEP 2
 110 LET L=5+8*RND
 120 FOR J=L TO 11+5*RND
 130 PRINT AT J,I, INK 0  PAPER 4 CHR$ 144 CHR$ 144
 140 NEXT J
 150 NEXT I
 160 LET O=37
 170 LET YD=INT (RND*500)+100-(HC*25)
 175 LET P=INT ( C 200+HC*2)
 180 LET CD=YD 32
 185 LET SH=0
 195 LET R=0
 200 FOR O=1 TO 2
 210 LET L=INT (RND*22)  LET I=INT (RND*25)
 220 FOR F=0 TO INT (RND*4)
 230 PRINT AT I+F L  INK 1 C$( TO 2+INT (RND*5))
 240 NEXT F
 250 NEXT O
 300 FOR F=1 TO 6  PRINT AT RND*20,RND*30, INK 0  PAPER 7 CHR$ 1[illegible]
 305 NEXT F
 310 FOR F=1 TO 6  PRINT AT RND*20,RND*29, PAPER 6, INK 6, BRIGHT 1,B$( TO INT (RND*4))  NEXT F
 360 LET HY=INT (RND*14+3)
 365 PRINT AT HY 1 29  PAPER 4, BRIGHT 1; INK 4;
 370 PRINT AT HY 29  PAPER 4, BRIGHT 1  INK 6     INK 0 CHR$ 14[illegible] INK 6,
 380 PRINT AT HY+1 29  PAPER 4 BRIGHT 1, INK 4
 390 LET X=INT (RND*2+1)  LET Y=INT (RND*19+1)
 400 PRINT AT  X  FLASH 1, T[illegible]
 410 PRINT AT 0 0,YD "YARDS"
 415 PRINT AT 0 12, "PAR  "P
 420 GO SUB 8000
 430 IF O=32 THEN LET R=1, PRINT AT 21,0, INK 2  FLASH 1, "IN THE ROUGH"
 440 IF O=87 THEN LET SH=SH+1  PRINT AT 21,0, INK 2, FLASH 1, "RIVER PENALTY SHOT"  AT Y X  INK 1; PAPER 7,CHR$ 147
 450 IF X=30 AND Y=HY THEN LET SH=SH+1  GO TO 6000
 460 IF O=100 THEN LET SH=SM+1 GO TO 6500
 470 IF O=112 THEN LET R=1  PRINT AT 21,0, INK 2, FLASH 1, "IN THE BUNKER"
 480 IF O=86 THEN LET SH=SH+1  PRINT AT 21,0, INK 2  FLASH 1 "TREE PENALTY SHOT"
 [illegible]
 [illegible] GO TO 420
 [illegible] PAUSE 200 [illegible]
 [illegible] PRINT  "YOU TOOK [illegible] FOR A PAR  "P"  HOLE [illegible]
 6010 IF SH 1 THEN PRI[illegible] "A HOLE IN ONE"
 6020 IF SH-P [illegible] THEN PRINT [illegible]
 6025 IF SH P THEN PRINT  "UNDER PAR"
 6030 IF SH P THEN PRINT  [illegible]
 6040 IF SH=P 1 THEN PRINT [illegible]
 6050 IF SH=P 2 THEN PRINT [illegible]
 6060 IF SH=P 3 THEN PRINT [illegible]
 6070 IF SH P-3 THEN PRINT [illegible]
 6080 IF SH=P THEN PRINT [illegible]
 6090 LET TP=TP+SH-P
 6100 PRINT  "YOU ARE [illegible] OVER PAR  AND TP [illegible] PAR  [illegible]
 6110 LET H=H+1
 6120 IF TH=H THEN PRINT  "YOU HAVE NOW COMPLETED THE   COURSE GOOD BYE"  STOP
 6200 PRINT   "PRESS ANY KEY"
 6400 PAUSE 0  GO TO 100
 6500 PAPER 4  CLS
 6510 PRINT AT 11 18,CHR$ 151
 6512 PLOT 132 80  DRAW 0 40 [illegible] DRAW -15 -10
 6514 LET O=0
 6516 IF [illegible] THEN LET O=0
 6520 LET Y=INT (RND*8)+INT [illegible]
 6530 LET X=INT (RND*18)+ INT [illegible]
 6540 PRINT AT Y,X CHR$ 149
 6541 IF X 29 AND Y>2 THEN PRINT OVER 1 AT Y,X+1 CHR$ 154,CHR$ 155 AT Y-1 X+1 CHR$ 162 CHR$ [illegible]
 6545 LET SH=SH+1
 6550 INPUT  "STRENGTH (1 TO 30)" S$
 6560 IF S$( 0  OR S$>"  THEN GO TO 6550
 6570 LET S=VAL S$
 6580 IF S>32 THEN GO TO 6550
 6590 INPUT  "DIRECTION (0 TO 12)" D$
 6600 IF D$( 0  OR D$>"  THEN GO TO 6590
 6610 LET D=VAL D$  IF D>12 THEN GO TO 6590
 6620 LET D=D*(PI/6)
 6625 PRINT AT Y X, OVER 1 CHR$ 149
 6626 IF X<28 AND Y>2 THEN PRINT OVER 1 AT Y,X+1,CHR$ 154,CHR$ 155 AT Y-1 X+1 CHR$ 162 CHR$ 163
 6630 LET X=INT (X+S*SIN D
 6640 LET Y=INT (Y S*COS D
 6645 IF X>31 THEN LET X=31
 6646 IF X<0 THEN LET X=0
 6647 IF Y<0 THEN LET Y=0
 6648 IF Y>21 THEN LET Y=21
 6650 PRINT AT Y X, FLASH 1, CHR$ 149
 6660 IF X=18 AND Y=11 THEN GO TO 6000
 6670 GO TO 6541
 8000 INPUT  "STRENGTH (1 TO [illegible])",S$
 8001 IF S$( 0  OR S$> [illegible] THEN GO TO 8000
 8002 LET S=VAL S$
 8005 IF S>((4-HC)*50+[illegible]) THEN GO TO 8000
 8007 LET S=S/CD
 8008 IF R=1 THEN LET S=S/2  LET R=0
 8010 INPUT  "DIRECTION (0 TO 12)" D$
 8011 IF D$( 0  OR D$> [illegible] THEN GO TO 8010
 8012 LET D=VAL D$
 8015 IF D>12 OR D<0 THEN GO TO 8010
 9020 PRINT AT Y,X
 9030 IF O=32 THEN PRINT INK 0, PAPER 4,CHR$ 144
 9040 IF O=37 THEN PRINT INK 0, PAPER 4,CHR$ 144
 9050 IF O=87 THEN PRINT INK 1 PAPER 7,CHR$ 148
 9060 IF O=112 THEN PRINT INK 6, PAPER 6,CHR$ 150
 9070 IF O=56 THEN PRINT INK 0, PAPER 7,CHR$ 145
 9080 LET D=D*(PI/6)
 9090 LET XI=X+S*SIN D
 9100 LET YI=Y-S*COS D
 9101 IF YI>21 OR YI<0 THEN LET SH=SH+1  PRINT AT 21 0, FLASH 1, "LOST BALL PENALTY SHOT"  GO TO 9110
 9102 IF XI>31 OR XI<0 THEN LET SH=SH+1  PRINT AT 21 0, FLASH 1, "LOST BALL PENALTY SHOT"  GO TO 9110
 9103 LET X=XI  LET Y=YI
 9110 LET X=INT (X+.5)  LET Y=INT (Y+.5)
 9115 LET O=ATTR (Y,X)
 9120 PRINT AT Y,X  FLASH 1, CHR$ 149
 9140 LET R=0
 9185 FOR F=1 TO 250
 9190 PRINT AT 21,0,  [illegible]
 9192 PRINT INK 0  PAPER [illegible]
 9195 NEXT F
 9200 RETURN
 9499 STOP
 9500 RESTORE 9550
 9505 FOR F=144 TO 155
 9510 FOR G=0 TO 7
 9520 READ A
 9530 POKE USR CHR$ F+G,A
 9540 NEXT G
 9550 NEXT F
 9560 DATA 85 170 85,170 85 170 85,170 85,120,255,255,120,[illegible]
 9570 DATA 120,60,60,30,30,60,60,120,24,28,24,16,16,16,16,56,0,60,126,126,126,126,60,0
 9580 DATA 12,4,[illegible]
 9590 DATA 0,0,0,0,0,0,0,0,0,3,28,28,28,12,24,60,220,60,[illegible]
 9600 RETURN
```



Golf
by Simon Goodson

Alien Invaders

on ZX81

Alien Invaders is a fast, addictive moving graphics game for the expanded ZX81 in which you are under siege from invading craft from outer space. As they move across the screen you have to try and shoot them down using your laser bases which you can move to the left and right using the 2 and 4 keys.

To fire press the 0 key. Try and hit them as quickly as possible as you'll score more if you do. But watch out though the aliens can drop bombs as well.

These are the main sections of the program and their purposes

Lines 1-31 Variables
Lines 60 94 Set up screen
Lines 100 160 Main program routine
Lines 200 240 Alien crossed screen
Lines 300 390 Firing routine
Lines 400-470 Direct hit on alien
Lines 1000 1200 Your base has been hit
Lines 1500 1550 End of game

Explanation of variables

K	—Best score
C	—Number of lives
S	—Score
A & B	—Position of alien
X & Y	—Your position

Data/Read

on ZX81

The idea is that data is stored in a string and the string read by the ZX81 string-slicing routines. The data-string is then reduced by the number of digits read.

In the example, the variable D$ is initialised at the start of the program by a GOSUB 1000, the data-string is then read two digits at a time — (2000 LET R$=D$(TO 2)) — and is then reduced in length by those two digits — (2010 LET D$=D$(3 TO))

The resulting R$ is then converted to a numeral by use of VAL. In using this routine it is essential that all data items are the same length. In the case of numerals they should be padded out with leading zeros, and non-numerics with trailing spaces. Restore is simply a GOSUB 1000 which redefines D$ to its original length

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```
    REM I BE ... COPYRIGHT 82
  7 LET T=0
  8 LET C=0
  9 LET S=0
 10 LET A=2
 11 LET X=20
 30 LET B=0
 31 LET  =12
 50 PRINT AT 1 0
 90 PRINT AT 0 3 "YOUR SCORE=
 91 IF C=3 THEN PRINT AT 0 21
 92           THEN PRINT AT 0 21
 93           THEN PRINT AT 0 31
 94 PRINT AT 1 3 "BEST SCORE="
100 FOR B=0 TO 27
101 PRINT AT A B              AT X,Y
102 LET 1=INT (RND*5)
103 IF 1 <3 THEN GOTO 114
104 FOR N=7 TO 19 STEP 4
105 IF N>7 THEN PRINT AT N-4,B
+2,
106 PRINT AT N B+2, U
110 NEXT N
111 IF B+2=Y+3 OR B+2=Y+4 OR B+
2=Y+2 THEN GOTO 1000
113 PRINT AT 19 B+2
120 IF INKEY$="2" AND Y>1 THEN
LET Y=Y-2
140 IF INKEY$="4" AND Y<27 THEN
LET Y=Y+2
150 IF INKEY$="9" THEN GOSUB 30
0
190 NEXT B
200 CLS
210 PRINT AT 10 3 "ALIEN CRAFT
SUCCESSFULLY          CROSSED
SCREEN
215 LET C=C-1
220 FOR N=1 TO 100
230 NEXT N
235 CLS
240 GOTO 1050
300 FOR N=17 TO 3 STEP -3
310 IF N<>17 THEN PRINT AT N+3
Y+3
320 PRINT AT N Y+3, A
330 NEXT N
340 PRINT AT 2,Y+3,
350 IF Y+3=B+1 OR Y+3=B+2 OR Y+
3=B+3 THEN GOTO 400
390 RETURN
400 FOR N=1 TO 10
410 PRINT AT 10,13 "BOOM ",AT
10,12,
430 NEXT N
440 PRINT AT 2,B+1,
450 PRINT AT 20,Y+3
456 PRINT AT 2 0
460 PRINT AT 10 0
465 FOR N=1 TO 10
466 NEXT N
467 LET S=S+(30-B)
470 GOTO 90
1000 PRINT AT 19,B+2
1010 FOR N=1 TO 20
1020 PRINT AT X,Y,          ,AT X
,Y
1050 NEXT N
1060 FOR N=1 TO 20
1062 NEXT N
1070 LET C=C-1
1080 IF C=0 THEN PRINT AT 0,20
1100 IF C=0 THEN GOTO 1800
1105 PRINT AT 0,0,
1200 GOTO 50
1800 CLS
1810 PRINT AT 10,0 "YOU MANAGED
TO SCORE  S  POINTS
1820 PRINT AT 17 0, "PRESS ANY KE
Y TO PLAY AGAIN
1825 IF S>K THEN LET K=S
1830 IF INKEY$="" THEN GOTO 1830
1840 CLS
1850 GOTO 0
```

Alien invaders
by Ian Benyon

```
   1 REM EXAMPLE OF DATA/READ
   2 REM ON ZX81 R K R PHILLIPS
   3 DIM R(10)
   4 DIM C(10)
   5 DIM A(10)
  10 GOSUB 1000
  15 FOR I=1 TO 10
  20 GOSUB 2000
  25 LET R(I)=VAL C$
  30 LET C(I)=INT (2*PI*R(I)*10+
.5)/10
  40 LET A(I)=INT (PI*R(I)**2*10+
.5)/10
  50 NEXT I
  60 PRINT "RADIUS" TAB 10 "CIRC
UM" TAB 20 "AREA"
  70 FOR I=1 TO 10
  80 PRINT R(I) TAB 10,C(I),TAB
20 A(I)
  90 NEXT I
  99 STOP
 999 REM DATA STRING IN D$
1000 LET D$="27391729730530081400
"
1005 REM NB ALL SAME LENGTH
1010 RETURN
1999 REM READ BY A$
2000 LET A$=D$( TO 2)
2010 LET D$=D$(3 TO )
2015 REM VARY BY LENGTH OF DATA
2020 RETURN

RADIUS    CIRCUM    AREA
27        169.6     2290.2
39        245       4778.4
17        106.8     907.9
29        182.2     2642.1
73        458.7     16741.6
85        534.1     22698
38        238.8     4536.5
61        383.3     11689.9
48        301.6     7238.2
69        433.5     14957.1
```

Data/Read
by Robin Phillips

UFO

on Atom

The object of the game is to shoot down UFOs which randomly move around the screen When you hit them they explode

If you have a 6522 Via on your Atom, you can hear the sound effects by fixing a speaker (via a driver) to CB2 (pin 11 on PL6) If you wish to create your own sounds it is very simple only 3 pokes are needed

Line 1 ?£B80B=16
Line 2 ?£B86A= any No from 1 to 255 (square wave mark space ratio)
Line 3 ?£B808= any No. from 1 to 255 (frequency)

String Sort

on ZX81

String Sort is a useful routine which will sort words or even full sentences into alphabetical order This can be very handy when a long list of people's names need to be used for a list such as a register of members at the local computer club

The program runs on a 16K ZX81 and output can easily be sent to the ZX printer by using the sequence *Break Copy Cont* at any time when a copy of the screen contents is desired (except during an *Input*)

As you would expect the string inputs are stored in a string array which is two-dimensional The program asks you how many words you have and what the maximum length of the word sentence is These are both maximum limits so if you don't know how many or how long your strings are then it is usually a good idea to be generous when you estimate your answers to the two questions

If at any time you have finished entering your list of words but the computer is waiting for the next word then input the keyword *Stop* as instructed by the program and the computer will go into *Fast* mode while it sorts the strings into order

I have taken exceptional care over the screen presentation, with such nice effects as

(1) If your word is more than one line long

turn to next page

```
0 P.$12' UFOufUFOufUFOufUFOufUFOufm"'
1 P.' *****************************"
2 P.''"THE OBJECT OF THE GAME IS TO    MOVE
THE UFO INTO "
3 P."YOUR SIGHTS   AND SHOOT IT DOWN"''
4 P."YOU HAVE 20 SHOTS WITH WHICH TO DO THIS"''
5 P. CTRL=UP;SHIFT-DOWN O LEFT;'''3 RIGHT;C-
FIRE''
6 P.         (PRESS A KEY)';LINKEFFE3
10 S=0
20 E=20
30 ?£B800=16
40 DIM AA8,BB15
50 I=0
60 AA0 219;AA1 36;AA2 126;AA3=255;AA4 129
90 CLEAR1
100 MOVE64,0;DRAW64,64
110 MOVE0,32;DRAW128,32
120 Q=A.R%1024+£8000
130 I=I+1
140 F.X=0TO4;?Q=AA(X);?Q;Q=Q+16,N
150 Q=Q-80
160 ?£B800=16;?£B80A=16;?£B808=A.R%60+100
170 F.X=0TO5,WAIT N.;?£B80A=0
180 F.X=0TO4,?Q=AA(X);?Q,Q=Q+16,N.;Q=Q-80
190 D=A.R.%3
200 IF D=0 Q=Q-A.R.%3
210 IF D=1 Q=Q+A.R.%3
220 IF D=2 Q=Q+A.R.%3*16
230 IF D=3 Q=Q-A.R.%3*16
240 IF ?£B001=247 GOS 330
250 IF ?£B001=191 Q=Q-(5*16)
260 IF ?£B001=127 Q=Q+(5*16)
270 IF ?£B001=239 Q=Q-2
280 IF ?£B001=253 Q=Q+2
290 IFE=0,P.$12"   YOUR LASER ENERGY HAS NOW RUN OUT
'''
300IFI=300,P.$12"   YOUR FUEL HAS NOW RUN OUT "''
310 IFI=300 OR E=0 P.'YOUR SCORE WAS"S,LINKEFFE3;RUN
320G.140
330 MOVE0,0;PLOT5,64,32;PLOT5,128,0
340 ?£B80A=33
350 F.X=255TO0 S.-1,?£B808=X;N.;E=E-1
360 IFQ>£8200-(16*3) AND Q<£8200+(16*3),GOS.380
370 S=S+100 G.90
370 MOVE0,0;PLOT7,64,32;PLOT7,128,0,R
380 MOVE64,32;C=64;H=32
390 DO C=C-4;H=H+4,DRAWC,H,MOVE64,32;U.C=64
400 DO C=C+4;H=H-4,DRAWC,H,MOVE64,32;U.C=44
410 DO C=C+4;H=H+4;DRAWC,H,MOVE64,32;U.C=64
420 DO C=C+4;H=H+4,DRAWC,H,MOVE64,32;U.C=84
430 F.X=0TO3
440 ?£B80A=44,F.C=0TO75,?£B808=C;N.
450 ?£B80A=44,F.C=175TO0 S.-1,?£B808=C;N.
460 N.;R
470 E.
480 REM**(C)P VERNON**1982**
```

UFO
by P Vernon

from previous page

on the screen then the computer automatically puts in the four-space margin on the left-hand side of the screen which is reserved for the number of the word (see lines 240 290).

(2) If your string is not of maximum length then the computer won't waste time printing out the remaining spaces of the array element in which the string is stored (see lines 250 and 530)

```
100 PRINT "STRING SORT   (C)DAVID
 M  WEBB"
110 PRINT "NUMBER OF WORDS"
120 INPUT N
130 PRINT N
140 PRINT "MAX LENGTH"
150 INPUT L
160 PRINT L
170 PRINT "TO EVALUATE EARLY
INPUT THE WORD  STOP"
180 DIM A$(N,L)
190 FOR A=1 TO N
200 IF PEEK 16442=3 THEN GOSUB
650
210 PRINT A TAB 4
220 INPUT A$(A)
230 IF A$(A,1)="STOP" THEN GO
TO 340
240 FOR F=1 TO L
250 IF A$(A,F TO F+(F<L))=""
THEN GOTO 300
260 IF PEEK 16441=1 AND PEEK 16
442=3 THEN GOSUB 710
270 IF PEEK 16441=1 THEN PRINT
TAB 4,
280 PRINT A$(A,F)
290 NEXT F
300 PRINT
310 NEXT A
320 CLS
330 FAST
340 LET K=1
350 IF CODE A$(K,1)=0 THEN GOTO
380
360 LET K=K+1
370 IF K<=N THEN GOTO 350
380 DIM B$(K-1,L)
390 FOR A=1 TO K-1
400 LET M=A
410 LET B$(A)=A$(A)
420 FOR C=1 TO K-1
430 IF B$(A)>A$(C) THEN GOSUB 6
10
440 NEXT C
450 LET A$(M)="  COPY"
460 NEXT A
470 CLS
480 SLOW
490 FOR A=1 TO K-1
500 IF PEEK 16442=3 THEN GOSUB
650
510 PRINT A TAB 4
520 FOR F=1 TO L
530 IF B$(A,F TO F+(F<L))=""
THEN GOTO 580
540 IF PEEK 16441=1 AND PEEK 16
442=3 THEN GOSUB 710
550 IF PEEK 16441=1 THEN PRINT
TAB 4,
560 PRINT B$(A,F)
570 NEXT F
580 PRINT
590 NEXT A
600 STOP
610 LET B$(A)=A$(C)
620 LET M=C
630 RETURN
640 LET A$(A)=""
650 GOTO 330
660 PRINT AT 0,10 [illegible]
670 IF INKEY$<>"" THEN GOTO 670
680 IF INKEY$="" THEN GOTO 680
690 CLS
700 RETURN
710 PRINT AT 0,19 [illegible]
720 IF INKEY$<>"" THEN GOTO 720
730 IF INKEY$="" THEN GOTO 730
740 CLS
750 PRINT TAB 4
760 RETURN
```

String sort
by David Webb

Canyon

on BBC Micro

"Canyon" was developed on a BBC model B microcomputer. It has been compressed to run on the model A. However, there is insufficient memory available in the model A unless the space reserved for the user supplied resident routines between &D00 and &E00 is made available to this program.

If the command PAGE = &D00 is entered BEFORE loading the program "Canyon" will then run on the model A.

This program was developed from Road Runner by Tim Hartnell as published in *Popular Computing Weekly* April 20 1982 vol 1 No 1. Substantial modifications and enhancements have been made.

The fleet is surrounded. There is only one chance. Someone must make it through the canyon to find reinforcements. Only a madman would venture through the narrow and treacherous canyon. As you no doubt qualify I will explain the controls. Use the cursor control keys to move left and right and the space bar to energise your laser.

Line 1 If escape is pressed goto average routine
Lines 2-3 Instructions
Lines 4-8 Initialisation
Lines 9-22 Main program section
Lines 23-28 Crash routine
Lines 29-43 Top 10 scores update and display routine
Lines 44-46 Display average and reset routine

I have got rather bored waiting for the BBC wordprocessor chip and so as a stopgap measure I have written a three-line wordprocessor for my Epson MX80 F/T printer. I keep this under the bit of plastic guarded by the BBC owl.

Line 10 MODE0
Line 20 VDU8 INPUT LINE "" I$
Line 30 VDU11 2 PRINTI$ VDU3:GOTO20

```
24UNTIL U=0
25M=(TIME DIV 10)/10-2.8
26 S%=S%+1:T%=T%+M:VDU5
27 MOVE0,1000:GCOL0,1:*FX15,1
28PRINT" CRASHED AT ";M;" KM"''" YOU ZAPPED ";SC;" MINES"
29X=TIME:REPEAT:UNTILTIME>X+300:MODE4:I%=0:SC=SC+M:REPEAT:I%=I%+1:
UNTIL SC>SC(I%) OR I%=10
32IFSC<=SC(I%) GOTO39
33VDU19,1,3,0,0,0:PRINT TAB(3,10)"YOUR SCORE IS IN THE TOP 10"'':
*FX15,135INPUT"PLEASE TYPE YOUR NAME  "N$:SCC=I%:REPEAT:H=SC(I%):H$
=N$(I%):SC(I%)=SC:N$(I%)=N$:SC=H:N$=H$:I%=I%+1:UNTIL I%=11:SC=SC(SCC)
39CLS:PRINT'''TAB(10)"THE TOP TEN SCORES ARE"
40FORI%=1 TO10:PRINT TAB(4,I%*2+4);SC(I%);TAB(20,I%*2+4);N$(I%):NEXT
I%:PRINT '''"       YOUR SCORE WAS "SC:*FX15,1
43X=GET:UNTILFALSE
44MODE4:VDU 31,0,15:PRINT"YOUR AVERAGE DISTANCE WAS ";((T%*100/S%)
DIV 10)/10;';"IN ";S%;" RUNS"'''"DO YOU WANT TO RESET THESE VALUES "
:IF GET$="Y" THEN T%=0: S%=0
46PRINT'' "   ....RESTART ? ":IF GET$<>"N" RUN ELSE*FX4,0
```

Canyon
by Peter Cassidy

Black Hole

on Vic 20

This is a Space Invader game with a difference. At any one time three Invaders pass in front of you from the top of the screen each having a different score value which you simply have to shoot. You can shoot the alien when it appears anywhere in the sight.

But beware there are six invisible black holes in front of you. You will be sucked into the black hole when the centre of the sight passes over one of these holes.

A good average for the game is 100. All keyboard directions are shown in the instructions.

The program runs in a minimum of 6.5K and can be used without any modification with any memory above that level.

Black hole
by N Echersley

Breaking up is always hard to do

David Hawkins explains how to disassemble Z80 instructions into mnemonics.

The ability of Sinclair Spectrum Basic to hold relatively complex data structures in a visible form, ie, in the program listing, is well demonstrated by this Z80 disassembler. This is made possible by the new (to ZX Basic) commands *Data* (with expressions as data) *Restore* (with a line-number pointer) *Read* and multi statement lines for greater speed (less line numbers for *Goto Gosub Return Restore* etc to search through)

The program provides a disassembly of all Z80 Instructions — indexed or otherwise — into mnemonics and optionally into byte values (decimals and characters/keywords) Illegal instructions are *Beeped* and *Flashed* whereupon the program goes into byte printing mode *Jr* opcodes are printed with actual addresses The program prints 2-3 lines a second

The instruction relationships and mnemonics are held in *Data* statement tables as opcode (or pointer) arguments (or pointers) and brackets requirements Some opcodes and arguments are contained in array tables, so certain *Data* lines hold pointers to the arrays — notice how an opcode can be built from two parts as in line 3271

Each instruction byte is rearranged and split to form a pointer to a *Data* line As certain instructions have a slightly different structure the opcode is replaced where relevant by an indicator and pointer to a further line eg line 1001 points to line 4000 modified by variable *b*

The lower case letters *u* to *z* are used to indicate special editing requirements before output ie insert Index registers calculate displacements double byte values etc

The program automatically determines the number of bytes in the instruction so printing the correct number of byte values is simple

Figure 1

```
45    RST   56
46    RST   56
47    RST   56
48    PUSH  BC
49    LD    HL,(23649)
52    PUSH  HL
53    JP    5790
56    PUSH  AF
57    PUSH  HL
58    LD    HL,(23672)
61    INC   HL
62    LD    (23672),HL
65    LD    A,H
66    OR    L
67    JR    NZ,72
69    INC   (IY+64)
72    PUSH  BC
73    PUSH  DE
74    CALL  703
77    POP   DE
78    POP   BC
Address Bytes Nobytes Continue
```

Variables used

a to e — components of split byte
f — index register displacement
g — indicates which argument is bracketed (0 = none) also used for byte printing
i — used for index instruction validation
k — indicates instruction classification
l — instruction block pointer
m — mnifiex 1 pointer also indicates which argument is being edited
p — address of byte being examined
p' — address of first byte of instruction
q — contents of byte being examined
s — indicates if byte values are to be printed 0 = no 1 = yes
z — Table initialisation *For* loop counts
a$ to c$ — opcode and two arguments
n$ — holds arguments for editing
i$ — holds "HL" "IX" or "IY" as required
r$ — contains flashing "?" for errors
o$ to y$ — Mnemonic tables
z$ — holds "+" or null for index register displacement

Detailed Description

1 Print title, etc Caps Lock and initialise

Main program

100 Input start address
110 Get first byte set class and index defaults
120 *Halt* opcode
130 Determine class of instruction
150-190 Index instructions
200 Split byte and rearrange set *Data* pointer to line and *Read* first item
230 If extended structure read next two items (line no and modifier) reset *Data* pointer and read item
240 Check for invalid opcode
250 Read two arguments and brackets indicator
260-270 Check/edit both arguments
280 If index instruction check if index editing was done
300-310 Insert brackets if necessary
700 Print disassembled instruction
720 Print byte values if required
740 Check for interrupt

Argument editing

920 'u' — displaced address
930 'v' — single byte value
940 'w' — doubel byte value
945 '†' — invalid argument
950 Set index edit flag
955 'y' — index register
960-900 'x' — index register and displacement

Tables

1001 1371 Instruction byte not equal 203 or 237
2071 2371 Instruction byte = 203
3071 3371 Instruction byte = 237
4001-4048 Extended instructions

Miscellaneous

4500-4550 Handle interrupts.
4900-4999 Determine mode and set up mnemonic arrays

When the program is *Run* it will ask if byte values are to be printed — press B (bytes to be printed) or N (not printed) Next it will ask for a start address for disassembly Printing will continue until a key is pressed The options are A — new address, B — byte values, N — no byte values or C — continue

Figure 1 shows the output address and mnemonics only, Figure 2 shows address, mnemonics and byte values Figure 3 contains the program listing

Possible enchancements

Use a 16K array to map and disassemble the Rom, marking addresses of *Calls*, *Jps* etc Follow only these established instruction addresses in the disassembly Place these symbolics into a large array and write with address array to Microdrive files for subsequent searching/editing Symbolic names can be given to many addresses eg system variables and commonly used subroutines

Next requirement — editor/assembler Watch this space!

Figure 2

```
4605  INC  B            4   ?
4606  JR   Z ,4633      40  (
                        25  ?
4608  LD   (23732),HL
                        34
                        180 TAN
                        92  \
4611  LD   DE,18047     17  ?
                        172 CODE
                        66  >
4614  LD   BC,168       1   ?
                        168 FN
                        0   ?
4617  EX   DE,HL        235 FOR
Address Bytes Nobytes Continue
```

```
1 PRINT AT 5,5,"Spectrum Disassembler": POKE 23658,8: GO SUB 4900
100 INPUT "Start address? ";p
110 LET p1=p: LET q=PEEK p: LET p=p+1: LET k=1: LET i$="HL"
120 IF q=118 THEN LET a$="HALT": LET b$="": LET c$="": GO TO 700
130 IF q=203 OR q=237 THEN LET k=2+(q=237): LET q=PEEK p: LET p=p+1: GO TO 200
150 IF q=221 THEN LET i$="IX"
160 IF q=253 THEN LET i$="IY"
170 IF i$<>"HL" AND PEEK p=118 THEN GO TO 850
180 IF i$<>"HL" THEN LET q=PEEK p: LET p=p+1: IF q=203 THEN LET k=2: LET f=PEEK p: LET p=p+1: LET q=PEEK p: LET p=p+1
200 LET a=INT (q/64): LET b=INT (q/8-a*8): LET c=q-b*8-a*64: LET d=INT (b/2)+1: LET e=b-2*d+3: LET a=a+1: LET b=b+1: LET c=c+1
RESTORE k*1000+a*100+c*10+e-111: READ a$
230 IF a$=">" THEN READ l,m: RESTORE l+m: READ a$
240 IF a$(1)="↑" OR a$(LEN a$)="↑" THEN GO TO 850
250 READ b$,c$,g
260 LET i=0: IF CODE b$>90 THEN LET d$=b$(1): LET m=1: GO SUB 900: LET b$=d$
270 IF CODE c$>90 THEN LET d$=c$(1): LET m=2: GO SUB 900: LET c$=d$
280 IF i$<>"HL" AND NOT i THEN GO TO 850
300 IF g=1 THEN LET b$="("+b$+")"
310 IF g=2 THEN LET c$="("+c$+")"
700 PRINT p1,TAB 6,a$,TAB 11,b$;: IF c$<>"" THEN PRINT ",";c$;
720 IF s THEN FOR z=p1 TO p-1: LET g=PEEK z: PRINT TAB 21,g,TAB 25,CHR$ (PEEK z AND (g<16 OR g>23)): NEXT z
730 PRINT : POKE 23692,255
740 IF INKEY$<>"" THEN GO TO 4500
800 GO TO 110
850 LET a$=n$: LET b$="": LET c$="": BEEP .1,0: LET s=1: GO TO 700
900 REM edit arguments
920 IF d$="u" THEN LET q=PEEK p: LET p=p+1: LET d$=STR$ (p+q-256*(q>127)): RETURN
930 IF d$="v" THEN LET q=PEEK p: LET p=p+1: LET d$=STR$ q: RETURN
940 IF d$="w" THEN LET q=PEEK p: LET d$=STR$ (q+256*PEEK (p+1)): LET p=p+2: RETURN
945 IF d$="↑" THEN LET d$=n$: BEEP .1,10: LET s=1: RETURN
950 IF i$<>"HL" THEN LET i=1
955 IF d$="y" THEN LET d$=i$: RETURN
960 LET g=m: IF i$="HL" THEN LET d$="HL": RETURN
970 IF k=1 THEN LET f=PEEK p: LET p=p+1
990 LET f=f-256*(f>127): LET z$="+" AND f>=0: LET d$=i$+z$+STR$ f: RETURN
1001 DATA ">",4000,b
1010 DATA "LD",s$(d),"w",0
1011 DATA "ADD","y",s$(d),0
1021 DATA ">",4010,b
1030 DATA "INC",s$(d),"",0
1031 DATA "DEC",s$(d),"",0
1041 DATA "INC",r$(b),"",0
1051 DATA "DEC",r$(b),"",0
1061 DATA "LD",r$(b),"v",0
1071 DATA v$(b),"","",0
1171 DATA "LD",r$(b),r$(c),0
1271 DATA x$(b),r$(c),"",0
1301 DATA "RET",q$(b),"",0
1310 DATA "POP",t$(d),"",0
1311 DATA ">",4020,d
1321 DATA "JP",q$(b),"w",0
1331 DATA ">",4030,b
1341 DATA "CALL",q$(b),"w",0
1350 DATA "PUSH",t$(d),"",0
1351 DATA "CALL","w","",0
1381 DATA x$(b),"v","",0
1371 DATA "RST",STR$ (b*8-8),"",0
2071 DATA w$(b),r$(c),"",0
2171 DATA "BIT",STR$ (b-1),r$(c),0
2271 DATA "RES",STR$ (b-1),r$(c),0
2371 DATA "SET",STR$ (b-1),r$(c),0
3071 DATA "↑"
3101 DATA "IN",r$(b),"C",2
3111 DATA "OUT","C",r$(b),1
3120 DATA "SBC","HL",s$(d),0
3121 DATA "ADC","HL",s$(d),0
3130 DATA "LD","w",s$(d),1
3131 DATA "LD",s$(d),"w",2
3140 DATA "NEG",o$(d),"",0
3141 DATA "↑"
3150 DATA "RETN",o$(d),"",0
3151 DATA "RETI",o$(d),"",0
3161 DATA "IM",p$(b),"",0
3171 DATA ">",4040,b
3231 DATA u$(c)+y$(b),"","",0
3371 DATA "↑"
4001 DATA "NOP","","",0
4002 DATA "EX","AF","AF'",0
4003 DATA "DJNZ","u","",0
4004 DATA "JR","u","",0
4008 DATA "JR",q$(b-4),"u",0
4011 DATA "LD","BC","A",1
4012 DATA "LD","A","BC",2
4013 DATA "LD","DE","A",1
4014 DATA "LD","A","DE",2
4015 DATA "LD","w","y",1
4016 DATA "LD","y","w",2
4017 DATA "LD","w","A",1
4018 DATA "LD","A","w",2
4021 DATA "RET","","",0
4022 DATA "EXX","","",0
4023 DATA "JP","y","",1
4024 DATA "LD","SP","y",0
4028 DATA "↑"
4031 DATA "JP","w","",0
4032 DATA "↑"
4033 DATA "OUT","v","A",1
4034 DATA "IN","A","v",2
4035 DATA "EX","SP","y",1
4036 DATA "EX","DE","HL",0
4037 DATA "DI","","",0
4038 DATA "EI","","",0
4041 DATA "LD","I","A",0
4042 DATA "LD","R","A",0
4043 DATA "LD","A","I",0
4044 DATA "LD","A","R",0
4045 DATA "RRD","","",0
4046 DATA "RLD","","",0
4048 DATA "↑"
4500 PRINT "Address Bytes Nobytes Continue"
4510 IF INKEY$<>"" THEN GO TO 4510
4520 IF INKEY$="A" THEN PAUSE 0: GO TO 100
4530 IF INKEY$="B" THEN LET s=1: GO TO 110
4540 IF INKEY$="N" THEN LET s=0: GO TO 110
4550 IF INKEY$="C" THEN GO TO 110
4560 GO TO 4520
4900 PRINT AT 21,5,"Bytes or Nobytes ?"
4910 IF INKEY$="B" THEN LET s=1: GO TO 4940
4920 IF INKEY$="N" THEN LET s=0: GO TO 4940
4930 GO TO 4910
4940 CLS
4990 LET n$=CHR$ 16+CHR$ 1+"?"
4995 LET o$="0↑↑↑"
5000 LET r$="BCDEHLxA"
5002 LET p$="0↑12↑↑↑↑"
5005 DIM s$(4,2): DIM t$(4,2)
5010 FOR z=1 TO 4
5015 LET s$(z)="BCDEySP"(2*z-1 TO 2*z)
5020 LET t$(z)="BCDEyAF"(2*z-1 TO 2*z)
5040 NEXT z
5050 DIM q$(8,2): DIM x$(8,3): DIM v$(8,4): DIM w$(8,3): DIM y$(8,2): DIM u$(8,2)
5055 FOR z=1 TO 8
5060 LET q$(z)="NZZ NCC POPEP M"(2*z-1 TO 2*z)
5065 LET x$(z)="ADDADCSUBSBCANDXORORCP "(3*z-2 TO 3*z)
5070 LET w$(z)="RLCRRCRL RR SLASRA↑↑↑SRL"(3*z-2 TO 3*z)
5075 LET v$(z)="RLCARRCARLA RRA DAA CPL SCF CCF "(4*z-3 TO 4*z)
5076 LET y$(z)="↑↑↑↑↑↑↑↑I D IRDR"(2*z-1 TO 2*z)
5077 LET u$(z)="LDCPINOT↑↑↑↑↑↑↑↑"(2*z-1 TO 2*z)
5080 NEXT z
6000 RETURN
9999 REM © Aug 82 David Hawkins
```

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INFORMATION, HELP ME

D McIlfatrick of Salloon, Co Fermanagh Northern Ireland writes

Q **I was about to order a 48K Spectrum when I came across a company offering an 80K Spectrum, for the price of a 48K model. This was done by supplying a 64K add on, in place of the 32K offered by Sinclair, at the same price.**

However, I have also read that the Z80a processor in the ZX81 can only address 64K, and 8K of that is used by the Sinclair Rom, so in fact the maximum available memory could only be 56K. Is this true of the Spectrum? I do not want to void my guarantee by having the 64K extra put in for no real gain, but if the claim is true it would be better for me to order a 16K Spectrum, and the 64K Ram extension

A The Z80a processor in the Spectrum can only address 64K In the Spectrum *16K* of that memory is used by the Rom, so it does not take a mathematical genius to work out that you will be left with a maximum possible 48K of user Ram at any one time This does not mean that you cannot have a memory capacity larger than 48K, as long as the balance is not being used

What the advertisement does not say is that the spare Ram can only be switched in after a corresponding or greater amount has been switched out to make room for it

This is just one of the first of many such add on memories of various sizes that will soon be available for the Spectrum Extra Rams produced by independents are likely to be cheaper than the £50 or £60 that Sinclair will charge

LOADING ONLY

M Haghseaas of Dunsmuir Grove Tyne & Wear writes

Q **I have written a few programs and would like to send them to your magazine, but I have no printer for my Vic20 However, I have access to a Pet with a printer I would be grateful if you could tell me how to *Load* my Vic programs onto a Pet, so I can get a proper printout.**

A For the unexpanded Vic20 type the first line in on the Pet, followed by *Poke* 4096 0 *Poke* 41,16 then *Clr/Ret* No changes need to be made for a Vic that has the 3K expansion If you have more than 3K then use the following *Poke* 41 18 *Poke* 4660 0 then *Clr/Ret*

POSTING THE PRICE

Simon Young of Hermon Avenue Blackpool Lancashire writes

Q **In the editorial of *Popular Computing Weekly*, July 22, you said that the Atari 400 could now be bought for under £200 I would be grateful if you could give me an accurate price, and an address where I could get one from.**

Could you also clear up another question about the same machine. It was said that the 400 model could not have more than 16K user Ram, but I have seen an advertisement for 48K Ram. Which is right?

A The cheapest Atari that I can find is £199 from Deans of Kensington 191 Kensington High Street, London W8 But, Deans do not say what postage and packing costs are

As for your second question, the Atari 6502 chip is capable of addressing 64K, of which a block of 16K is allocated to memory However, the 400 is designed in such a way that only 16K of this can be normally accessed

The 48K extension is not recognised by Atari, whose technical department said that such an expansion will *Void the warranty* as physical changes to the pcb are needed However, Maplin assured me that they offer their own one year guarantee

If you read our August 26 issue you will see that Maplin chose to work with the Atari because it had so much potential No one can doubt that the machine offers superb graphics But it does strike me as odd that a company should develop a machine with so much potential, and then make it difficult for that potential to be fully realised by the average user

. . . FROM SANTA

Andrew Morgan of Buscot Drive Abingdon Oxford, asks

Q **Could you please tell me if there is a machine code book available for the ZX Spectrum. Also do you know which tape recorders are compatible with ZX computers.**

A As yet there are no Spectrum machine code books available that I know of However, I know that at least one book is in preparation and I would not be surprised if there were more

There is going to be another ZX Microfair in November and I would suggest that you keep a look out around then The run up to Christmas seems a logical time to release such a book

As for tape recorders, Monolith makes a machine that is designed particularly for *Loading* and *Saving* on the ZX81 Data-Assette sells a Ferguson model that is also meant to remove the trouble normally associated with the ZX machines

The Spectrum s *Load/Save* facilities have been improved by the introduction of a Schmit trigger As yet, I have come across no *Save/Load* problems on the Spectrum All you have to ensure is that your recorder has jack sockets of the right size (3 5mm)

Data-Assette is based at 44 Shroton Street London NW1 6UG Monolith's address is 5-7 Church Street, Crewkerne Somerset

CAUGHT NAPPING

R S Guhra of Alicia Gardens Harrow Middlesex writes

Q **On Page 5 of *Popular Computing Weekly*, June 17, you say that the Spectrum has a design fault, and in the review section you say that it is crude and bug ridden Only yesterday I ordered a Spectrum, but I feel uneasy and unsure of my choice now. Are there any simple programs which I can use to Beachtest my Spectrum and check all its functions easily?**

On receipt of my Spectrum, I am allowed two weeks to make up my mind as to whether I want to purchase it. It would be useful to use this time to test the Spectrum to see if it malfunctions The most obvious is *Print* 2+2 to see if it answers four But there must be other programs to test it exhaustively.

A This is what happens when a company supplies a pre-production model for review All the faulty Spectrums were caught before going out to the public (as far as we know) Only the computer press got the bad machines, and that has not done Uncle Clive s reputation much good

You do not say whether you ordered a 16K machine or a 48K machine Only the 16K machines were faulty, and these now have an extra Nand gate wired in Our machine has had this modification and, apart from the fact that it looks messy we have so far found no further bugs It is thought that the later 16K machines will have the fault rectified on the pcb

The 48K machines are late for the simple reason that Sinclair made the same mistake as Acorn in underestimating the demand for the larger machine Far more people ordered the 48K version, and Sinclair Research were just not geared up to meet this demand

● *Stop agonising over that problem Write to Ian Beardsmore Peek and Poke, Popular Computing Weekly, Hobhouse Court, 19 Whitcomb Street, London WC2 7 HF*

Ian Beardsmore regrets that he cannot answer each question personally so please do not enclose a SAE

Competitions

Past your prima?

by Gordon Lee

It is useful to catagorise numbers in convenient groups. For example a number can be odd or even positive or negative high or low rational or irrational or prime or composite

The last two terms are particularly interesting. A composite number is one that is divisible by numbers or factors other than itself and 1 — 78 is a composite as it has the factors 13 and 6. Six is itself a composite being 2 × 3. However 13, 3 and 2 cannot be subdivided any further so these are said to be prime. We can therefore say that the prime factors of 78 are 2, 3 and 13. Any composite number has a unique set of prime factors.

Unfortunately there is no easy way of telling if a number is prime or composite. Two is the only even prime number. If the last digit is a five then it is divisible by 5. After that however there is no way of telling — each number must be laboriously checked to see if it is prime.

The following program divides a chosen number by all the primes between 3 and the square root of the number. (In fact for simplicity it divides by all odd numbers but these must include all primes greater than 3.)

```
10 PRINT  ENTER AN ODD NUMBER
20 INPUT T
30 IF T/2   INT (T/2) = 0 THEN GOTO 20
40 FOR N   3 TO (SQR T) + 0 5
50 IF T/N   INT (T/N)   0 THEN GOTO 100
60 NEXT N
70 PRINT T     IS PRIME
80 STOP
100 PRINT T    IS NOT PRIME
110 PRINT  IT HAS FACTORS     N  AND    T/N
```

The Greek mathematician Eratosthenes in the third century BC was the first to develop a technique for determining primes. First write out a list of all odd numbers from 3 up to as far as we wish to go. Take the first number 3, circle it and then divide each number in the list by three. Cross out all the multiples of three.

At the end of the list go back to the next number after 3 that is *not crossed out*. This is 5, the next prime. Circle it and repeat the process crossing out all multiples of 5 in the list. Continue until all the numbers are either circled or crossed out. The circled numbers are the primes.

3	5	7	9	11	13	15	17	19	21
23	25	27	29	31	33	35	37	39	41
43	45	47	49	51	53	55	57	59	61
63	65	67	69	71	73	75	77	79	81
83	85	87	89	91	93	95	97	99	101

This may be cumbersome, but it is one of the few methods by which primes and composites can be separated.

Since the turn of the century a large table of primes has been compiled and is housed in the Vienna Academy of Sciences. Unfortunately, the six volume work containing all the primes between 1 and 100 000 000 has one volume missing. As a result there is a task awaiting anyone who is prepared to check the numbers between 13 million and 23 million.

Here is a problem that will be answered in two weeks time. Can you give a proof that it is impossible to construct a right angled triangle with all the sides having a prime number of units?

Puzzle No 23

Several early attempts were made to find a formula that would generate prime numbers only. One such attempt was $p = z^2 + z + 41$ where z is a positive integer. When $z = 1$ the formula gives the prime 43 and gives further primes for higher values of z.

Unfortunately the formula is not infallible. What is the lowest positive integer for which this formula fails to give a prime number?

Solution to Puzzle No 19

The areas of the two pools are the same. So the area of half the Smith's pool is π × 12.5 × 12.5/2 which is the area of the larger sector AOB plus the area of the triangle AOB.

In the diagram the area of the sector AOB = (π × 81 × (360 − (ACS (X/9) × 360/π))/360) and the area of the triangle AOB = (X × SQR(81 − X × X))

The program assigns a value to X which is used to find the area of the Smith's pond A. This is compared with the area of the Jones pond J and X is corrected accordingly.

```
10 LET X = 0
20 LET J = PI * 12 5 * 12 5/2
30 LET A = (PI * 81 * (360 - (ACS (X/9) *
   360/PI))/360) + (X * SQR (81   X * X))
40 IF ABS (A - J) < 0 000001 THEN GOTO 100
50 LET X = X * J/A
60 GOTO 30
100 PRINT  X =      X
```

The distance apart of the centres of the two circles 2X is found using the program to be 15.224 ft.

Winner of Puzzle No 19

The winner is Mark Chidlow, Mountbatten Avenue, Sandal, Wakefield, W Yorks who receives £10

